

## CLAIMS

1. An optical film composed of a thermoplastic resin film obtained by using a melt extruding machine,  
5 characterized in that

said thermoplastic resin film satisfies a relation of the formula below over the whole surface of the film when an angle made by the extruding direction of the thermoplastic resin film from the melt extruding  
10 machine and a slow phase axis at each point is  $\alpha$ , and a retardation amount at each point is  $Re$ .

$$[\sin^2 2\alpha] \times [\sin^2 (\pi \cdot Re / 550)] \leq 4.0 \times 10^{-5}$$

2. The optical film as set forth in claim 1,  
15 wherein a value of said  $Re$  is 10 nm or less.

3. The optical film as set forth in claim 1 or 2, wherein said thermoplastic resin is an alicyclic structure containing polymer.

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4. A production method of an optical film composed of a thermoplastic resin film, including a step of cooling a molten thermoplastic resin extruded from an extruding machine by making it successively circumscribed  
25 with a first cooling drum, a second cooling drum and a

third cooling drum:

wherein, when assuming that rotation speed of said third cooling drum is  $R_3$  (m/min.), and rotation speed of said second cooling drum is  $R_2$  (m/min.), a ratio of the  $R_3$  and  $R_2$  ( $R_3/R_2$ ) is made to be 0.990 or more but less than 0.999 to cool said thermoplastic resin.

5. The production method of an optical film as set forth in claim 4,

10 wherein, when assuming a resin contact time in said first cooling drum is  $t_1$  (sec.), a temperature when said thermoplastic resin moves away from said first cooling drum is  $T_{p1}$  ( $^{\circ}\text{C}$ ), and a glass transition temperature of said thermoplastic resin is  $T_g$  ( $^{\circ}\text{C}$ ),  $t_1 \times$   
15 ( $T_{p1} - T_g$ ) (unit: sec. $\cdot$ deg) is made to be -50 or higher and 20 or lower to cool said thermoplastic resin.

6. The production method of an optical film as set forth in claim 4,

20 wherein, when assuming that rotation speed of said first cooling drum is  $R_1$  (m/min.), a ratio of the  $R_2$  and  $R_1$  ( $R_2/R_1$ ) is made to be 0.990 or more but less than 1.01 to cool said thermoplastic resin.

25 7. The production method of an optical film as

set forth in claim 4,

wherein, when assuming that a temperature when said thermoplastic resin moves away from said third cooling drum is  $Tp_3$  ( $^{\circ}C$ ), the  $Tp_3$  is made to be a lower  
5 temperature than said  $Tg$  by 50 to  $100^{\circ}C$  to cool said thermoplastic resin.

8. The production method of an optical film as set forth in claim 4,

10 wherein, when assuming that a temperature when said thermoplastic resin moves away from said second cooling drum is  $Tp_2$  ( $^{\circ}C$ ), the  $Tp_2$  is made to be a lower temperature than said  $Tg$  by 0 to  $60^{\circ}C$  to cool said thermoplastic resin.

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9. The production method of an optical film as set forth in claim 4,

wherein, a temperature difference of said first cooling drum and said second cooling drum is made  
20 to be  $20^{\circ}C$  or less to cool said thermoplastic resin.

10. A protective film of a polarizer composed of the optical film as set forth in any one of claims 1 to 3.

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11. A polarizing film having a polarizer and a

protective film as set forth in claim 10 stacked on one surface or both surfaces of the polarizer via an adhesive layer.

- 5           12.   A phase difference film obtained by performing stretch processing on the optical film as set forth in any one of claims 1 to 3.